

## WHAT IS CLAIMED IS:

1                   1.     A nanoparticle processed textile and polymer system, said nanoparticle  
2     processed textile and polymer system comprising:  
3                   a textile material having an embedded nanoparticle.

1                   2.     The nanoparticle processed textile and polymer system of claim 1,  
2     wherein said textile material is a member selected from the group consisting of fabric, yarn  
3     and fiber.

1                   3.     The nanoparticle processed textile and polymer system of claim 1,  
2     wherein said textile material is a member selected from the group consisting of cellulose,  
3     cotton, linen, hemp, jute, ramie, wool, mohair, vicuna, silk, rayon, lyocell, acetate, triacetate,  
4     azlon, acrylic, aramid, nylon, olefin, polyester, spandex, vinyon, vinal, graphite, metallic  
5     textiles, ceramic textiles and mixtures thereof.

1                   4.     The nanoparticle processed textile and polymer system of claim 2,  
2     wherein said textile material is a fabric selected from the group consisting of cellulosic,  
3     cellulosic-synthetic blend, and synthetic material.

1                   5.     The nanoparticle processed textile and polymer system of claim 4,  
2     wherein said textile material is cellulosic.

1                   6.     The nanoparticle processed textile and polymer system of claim 5,  
2     wherein said cellulosic material is fabricated into a member selected from the group  
3     consisting of a diaper, napkin, a table cloth, a bandage, a gauze, an underpant, a medical  
4     garment, a surgeon's gown, a cap, a mask, a surgical cover, a patient drape, a carpeting, a  
5     bedding material, an underwear, a sock, and a uniform.

1                   7.     The nanoparticle processed textile and polymer system of claim 4,  
2     wherein said textile material is a synthetic polymer selected from the group consisting of  
3     PET, acrylic and nylon.

1                   8.     The nanoparticle processed textile and polymer system of claim 1,  
2     wherein the size of said nanoparticle is about  $10^{-9}$ m to about  $10^{-7}$  m.

1                   9.     The nanoparticle processed textile and polymer system of claim 1,  
2 wherein said nanoparticle is selected from the group consisting of an organic nanoparticle  
3 and an inorganic nanoparticle.

1                   10.    The nanoparticle processed textile and polymer system of claim 9,  
2 wherein said inorganic nanoparticle is a metal oxide.

1                   11.    The nanoparticle processed textile and polymer system of claim 10,  
2 wherein said metal oxide is selected from the group consisting of  $\text{Fe}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{Ag}_2\text{O}$ , and  
3  $\text{CuO}$ .

1                   12.    The nanoparticle processed textile and polymer system of claim 9,  
2 wherein said inorganic nanoparticle is a metal.

1                   13.    The nanoparticle processed textile and polymer system of claim 12,  
2 wherein said metal is selected from the group consisting Ag, Cu, Fe, and Zn.

1                   14.    The nanoparticle processed textile and polymer system of claim 9,  
2 wherein said nanoparticle is a carbon-black nanoparticle.

1                   15.    The nanoparticle processed textile and polymer system of claim 1,  
2 wherein said embedded nanoparticle imparts a functionality selected from the group  
3 consisting of coloration, a waterproof finishing, soil repellent finishing, fire resistance  
4 finishing, wrinkle free finishing, anti-UV finishing, antimicrobial finishing and antistatic  
5 finishing.

1                   16.    A nanoparticle formulation for textiles, said formulation comprising:  
2 a nanoparticle;  
3 a dispersant; and  
4 optionally a thickener.

1                   17.    The nanoparticle formulation for textiles of claim 16, wherein said  
2 nanoparticle is selected from the group consisting of an organic nanoparticle and an inorganic  
3 nanoparticle.

1                   18.    The nanoparticle formulation for textiles of claim 16, wherein said  
2 nanoparticle is a carbon-black nanoparticle.

1                    19.     The nanoparticle formulation for textiles of claim 16, wherein said  
2 dispersant is selected from an anionic surfactant, a cationic surfactant, a nonionic surfactant,  
3 and a zwitterionic surfactant.

1                    20.     The nanoparticle formulation for textiles of claim 16, wherein said  
2 dispersant is a polymeric dispersant selected from the group consisting of a polyacrylic acid  
3 and salt thereof.

1                    21.     The nanoparticle formulation for textiles of claim 16, wherein said  
2 polyacrylic salt is selected from the group consisting of polyacrylate, polyethylenimine, oxo  
3 alcohol, and copolymeric carboxylate.

1                    22.     The nanoparticle formulation for textiles of claim 16, further  
2 comprising a thickener.

1                    23.     The nanoparticle formulation for textiles of claim 16, wherein said  
2 thickener is selected from the group consisting of starch, modified starch, modified cellulose,  
3 polyvinyl acetate, polyvinyl alcohol, polyethylene glycol, polyacrylates, silicones and  
4 copolymers of vinyl polymers.

1                    24.     A method for making a nanoparticle processed polymer composition,  
2 said method comprising:  
3                    diffusing a nanoparticle into a polymer matrix to form an embedded  
4 nanoparticle in said polymer matrix, thereby making said nanoparticle processed polymer  
5 composition.

1                    25.     The method for making a nanoparticle processed polymer composition  
2 of claim 24, wherein said nanoparticle diffuses at the glass-transition temperature of said  
3 polymer matrix.

1                    26.     The method for making a nanoparticle processed polymer composition  
2 of claim 24, wherein the free volume of said polymer matrix is greater in diameter than said  
3 nanoparticle.

1                   27.     The method for making a nanoparticle processed polymer composition  
2 of claim 24, wherein said polymer matrix is heated to above its glass transition temperature  
3 prior to facilitate the diffusion of said nanoparticle.

1                   28.     The method for making a nanoparticle processed polymer composition  
2 of claim 24, wherein said polymer matrix is a member selected from the group consisting of  
3 polyester, polyamide, polyethylene, polypropylene, polystyrene, polyvinylchloride  
4 polyamideimide, polyethersulfone, polyarylsulfone, polyetherimide, polyarylate, polysulfone,  
5 polycarbonate, polystyrene, polyetherketone, polyetheretherketone, polytetrafluoroethylene,  
6 nylon-6,6, nylon-6,12, nylon-11, nylon-12, acetal resin, and aramid.

1                   29.     The method for making a nanoparticle processed polymer composition  
2 of claim 28, wherein said polymer matrix is selected from the group consisting of PET and  
3 acrylics.

1                   30.     A method for dyeing a textile having a polymeric matrix, said method  
2 comprising:  
3                   diffusing a colored nanoparticle into a textile having a polymer matrix to form  
4 an embedded colored nanoparticle in said textile having said polymer matrix, thereby dyeing  
5 said textile.

1                   31.     The method for dyeing a textile having a polymeric matrix of claim 30,  
2 wherein said colored nanoparticle diffuses at the glass-transition temperature of said polymer  
3 matrix.

1                   32.     The method for dyeing a textile having a polymeric matrix of claim 30,  
2 wherein the free volume of said polymer matrix is greater in diameter than said colored  
3 nanoparticle.

1                   33.     The method for dyeing a textile having a polymeric matrix of claim 30,  
2 wherein said polymer matrix is heated to above its glass transition temperature prior to  
3 facilitate the diffusion of said colored nanoparticle.

1                   34.     The method for dyeing a textile having a polymeric matrix of claim 30,  
2 wherein said polymer matrix is a member selected from the group consisting of polyester,  
3 polyamide, polyethylene, polypropylene, polystyrene, polyvinylchloride polyamideimide,

- 4 polyethersulfone, polyarylsulfone, polyetherimide, polyarylate, polysulfone, polycarbonate,
- 5 polystyrene, polyetherketone, polyetheretherketone, polytetrafluoroethylene, nylon-6,6,
- 6 nylon-6,12, nylon-11, nylon-12, acetal resin, and aramid.